1.6 LITER 4 CYLINDER

Chevette

IDENTIFICATION CODING

ENGINE IDENTIFICATION

Engine can be identified by the eigth digit of Vehicle Identification Number, located on left upper side of instrument panel and visible through the windshield. Engine also has a code number stamped on pad at right side of block, below number 1 spark plug hole.

Engine Code	
Engine	**Code**
1.6L (98") 2-Bbl.	9

ENGINE REMOVAL

See Engine Removal at end of ENGINE Section.

CYLINDER HEAD & MANIFOLDS

INTAKE MANIFOLD

Removal – 1) Drain cooling system and remove air cleaner. Disconnect battery negative cable. Disconnect all vacuum hoses and the upper radiator and heater hoses at the intake manifold.

2) Disconnect all wiring, hoses, linkage and fuel lines from carburetor. Remove spark plug from clip at intake manifold. Remove distributor cap, coil cover and coil. Remove intake manifold attaching bolts and remove intake manifold.

Installation – 1) Clean all gasket mating surfaces. Install intake manifold with new gasket and tighten bolts, starting in center and working outward in rotary sequence.

2) Reverse removal procedure to complete assembly. Ensure that all drive belts are properly adjusted and that cooling system has been refilled. Start engine and run until it reaches normal operating temperature. Check for leaks.

EXHAUST MANIFOLD

Removal – 1) Disconnect battery negative cable. Raise vehicle and disconnect exhaust pipe at manifold flange.

2) Lower vehicle and disconnect carburetor heat tube. Remove pulse air injection tubing, if equipped. Remove exhaust manifold bolts and manifold.

Installation – 1) Clean all mating surfaces of manifold and head. Install manifold and torque to specification.

NOTE – *Install inner 2 bolts first as locating bolts.*

2) Reverse disassembly procedure to complete installation. Start engine and check for exhaust leaks.

CYLINDER HEAD

Removal – 1) Disconnect negative battery cable. Remove accessory drive belts. Remove engine fan and timing belt cover. Loosen idler pulley and remove timing belt from camshaft sprocket.

2) Remove air cleaner and silencer assembly. Drain cooling system. Disconnect upper radiator hose at thermostat housing and heater hose at intake manifold. Remove accelerator cable support bracket.

3) Disconnect all wiring including spark plug wires. Raise vehicle and disconnect exhaust pipe from manifold. Lower vehicle and disconnect oil dipstick tube from manifold.

NOTE – *Be sure to remove wires for idle solenoid, choke, temperature sending unit and alternator.*

4) Disconnect fuel line at carburetor. Remove coil, camshaft covers, camshaft, rocker arms, guides and valve lifters with shims.

NOTE – *Be sure to keep rocker arms, guides, lifters and shims in order for installation in original location.*

5) Remove camshaft carrier from cylinder head. Remove head from engine.

Installation – 1) Install new head gasket over dowel pins with legend, "This Side Up" facing upward. Place head and manifold assembly on engine.

2) Apply Loctite No. 514 or GM No. 1052357 Sealer (or equivalent) to top of head or cam carrier mating surfaces. Coat head bolts with engine oil and tighten in sequence. See *Fig. 1*. Reverse removal procedure to complete installation.

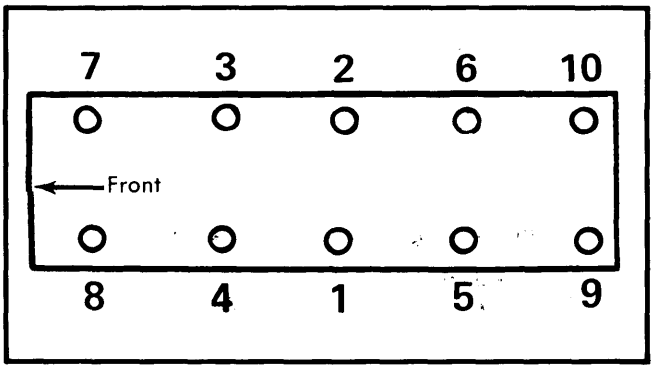

Fig. 1 Cylinder Head Tightening Sequence

VALVES

VALVE ARRANGEMENT

I-E-I-E-I-E-I-E (Front to rear).

VALVE GUIDE SERVICING

Guides are integral with cylinder head. If valve stem clearance in guide is excessive, valves with .003" (.075 mm), .006" (.150 mm), and .012" (.300 mm) oversize stems are available. Ream guide bores to accommodate oversize stems and provide specified clearances. Use reamers from suitable set (J-26590).

1.6 LITER 4 CYLINDER (Cont.)

VALVE STEM OIL SEALS

Install oil seal on valve stem before installing spring. Make sure that seal is flat and not twisted.

NOTE – *Do not interchange intake and exhaust seals. Intake seals are identified by the letters "IN" and exhaust by "EX".*

VALVE SPRINGS

Removal – 1) Remove camshaft covers, depress valve spring with valve spring compressing tool (J-25477) and remove rocker arms.

NOTE – *Keep rocker arms and guides separate for installation in original locations.*

2) Remove spark plug and install a suitable air line adapter (J-23590) to spark plug port. Apply air pressure. Then compress valve springs and remove rocker guides, valve retainers, caps, springs and valve stem oil seals.

Installation – 1) Test spring with suitable spring tester (J-8056). Replace springs if not within 10 pounds of specifications.

2) Install oil seal, compress valve spring and cap and install retainers and rocker guides.

NOTE – *Grease may be used to hold retainers in place.*

3) Release spring tension ensuring retainers seat properly. Reverse removal procedure to complete assembly.

VALVE SPRING INSTALLED HEIGHT

Specified height is 1.26" (32 mm) measured from top of spring seat or shim to top of valve spring. If measured height exceeds specifications, install valve spring seat shim(s) to bring back within specifications.

VALVE STEM INSTALLED HEIGHT

Specified height is .71" (18 mm) measured from end of valve stem to top of cylinder head. This height is required to assure correct operation of hydraulic lifters. If measured height exceeds specifications, grind tip of valve.

CAUTION – *Do not grind more than .030" (.75 mm) from any exhaust valve tip.*

HYDRAULIC VALVE LASH ADJUSTERS

NOTE – *Lash adjusters are serviced as complete assemblies only. Parts are not interchangeable.*

No adjustment of lash adjusters is required. Servicing of adjusters requires only that care and cleanliness be exercised in the handling of parts. Adjusters must be full of oil prior to installation and oiling holes in cylinder head must be free of obstruction.

PISTONS, PINS & RINGS

OIL PAN

See Oil Pan Removal at end of ENGINE Section.

PISTON & ROD ASSEMBLY

NOTE – *New pistons must be installed in same cylinders for which they were fitted and used pistons in same cylinder from which they were removed.*

Removal – 1) With cylinder head and oil pan removed, use a ridge reamer to remove any ridge or deposits on upper end of cylinder bore.

NOTE – *Piston must be at bottom of stroke and covered with cloth to collect cuttings.*

2) Inspect rods and caps for cylinder identification and mark as necessary. Remove rod cap and cover studs with rubber tubing to protect crankshaft and cylinder walls.

3) Carefully push piston and rod assembly out top of cylinder block.

Installation – 1) Lightly coat cylinders, pistons, and rings with engine oil. Ensure ring gaps are properly spaced. See *Fig. 2*. Marked side of compression rings must be toward top of piston.

2) Install ring compressor (J-26468) on piston ensuring ring gap positions do not change. Install piston and rod assembly with notch in piston top facing front of engine.

3) Tap piston and rod assembly carefully into correct cylinder using a wooden handle of a hammer.

NOTE – *Do not damage cylinder wall or crankshaft journal with rod studs. Protect with rubber tubing.*

4) With connecting rod seated on crankshaft journal, install rod caps and tighten nuts.

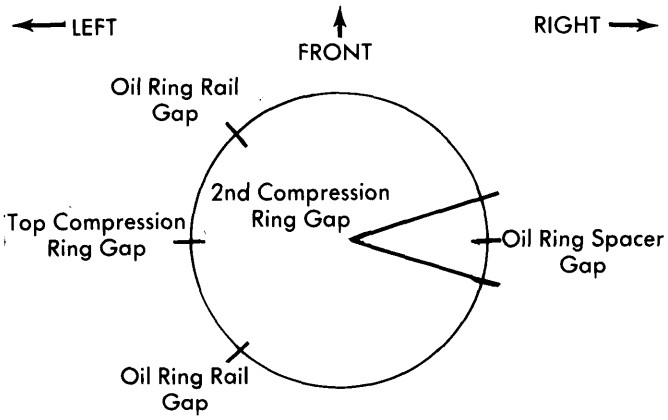

Fig. 2 Ring Gap Location on Piston

FITTING PISTONS

Measure piston bore diameter, then measure piston diameter at skirt across centerline of piston pin. Maximum acceptable clearance is .002" (.050 mm) for either a used or new piston in worn cylinder bore. Oversize pistons are available in .001" (.025 mm) and .030" (.75 mm) oversize.

1.6 LITER 4 CYLINDER (Cont.)

PISTON PINS

Inspection – Piston and piston pin are matched set and are not serviced separately. Measure diameter of piston pin with a micrometer and measure piston pin bore with a dial bore gauge or inside micrometer. If clearance is in excess of specifications, replace piston and piston pin.

Removal – Place piston and rod assembly on suitable support (J-24086-20). Using a pilot tool (J-24086-8) as a driver, use arbor press to push pin from piston and rod.

Installation – Lubricate piston pin bores in piston and connecting rod and assemble rod to piston. Place piston on suitable support (J-24086-20) and using a pilot tool (J-24086-9) and arbor press, push pin into piston and rod assembly. Check piston for freedom of movement on pin.

CRANKSHAFT & ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

NOTE – *Following procedures are with oil pan removed. Bearings are precision insert type and do not utilize shims. Do not file rods or rod caps.*

Connecting Rod Bearings – 1) Remove rod caps after ensuring caps and rods are marked for cylinder identification. Use Plastigage method to check for proper clearances.

2) Replace bearings not within specifications. New bearings are available in standard, .001" (.025 mm) and .002" (.050 mm) for new and used crankshafts, and in .010" (.25 mm) and .020" (.50 mm) for reconditioned crankshafts.

3) Selective fitting is required for each connecting rod. Coat bearing surfaces with oil. Install rod cap with bearing and tighten nuts.

NOTE – *Standard bearing halves may be used with a .001" (.025 mm) undersize bearing.*

4) When all bearings are checked and installed, tap each connecting rod lightly forward and rearward along crankshaft to ensure clearance. Measure rod side clearance between connecting rod and side of crankpin.

Main Bearings – 1) With oil pan removed, support crankshaft at both ends. Start with rear main cap and work forward. Remove one cap at a time and use Plastigage method to check clearances. Replace bearings not within specifications.

2) When checking No. 1 bearing, loosen accessory drive belts to prevent tapered reading from Plastigage. New bearings are available in standard, .001" (.025 mm) and .002" (.050 mm) for new and used crankshafts, and in .010" (.25 mm) and .020" (.50 mm) for reconditioned crankshafts.

NOTE – *Some journals on some crankshafts (not necessarily all journals) may be factory-ground to .010" (.250 mm) undersize.*

3) Check crankshaft journal for wear. If journal is not within specifications, remove crankshaft and grind to .010" (.250 mm) undersize.

NOTE – *A standard bearing half may be used with a .001" (.025 mm) undersize or a .001" (.025 mm) undersize bearing may be used with a .002" (.050 mm) to obtain correct clearance.*

4) Using a suitable tool, installed in crankshaft oil hole, rotate crankshaft clockwise to remove upper bearing half. Coat new upper bearing half with engine oil, press firmly to crankshaft journal and rotate bearing into place by turning crankshaft in counterclockwise direction.

5) Oil new lower bearing and install in bearing cap. Install main bearing cap with arrows pointing toward front of engine. Tighten all bearing caps except rear main, to specifications. Tighten rear main cap to 10-12 ft. lbs., then tap crankshaft rearward, then forward with lead hammer. Retorque all caps to specifications.

THRUST BEARING ALIGNMENT

With crankshaft forced toward front of engine, check end play at front of number five bearing cap with a feeler gauge. If end play exceeds specifications, thrust bearings must be replaced.

REAR MAIN BEARING OIL SEAL

Removal – With engine removed from vehicle, remove oil pan and rear main bearing cap. Clean bearing cap and cylinder block and inspect crankshaft seal surface for excessive wear, nicks, etc.

Installation – 1) Install new seal in cylinder block, taking care to seat seal against rear main bearing bulkhead. Install rear main bearing cap.

2) Install and tighten cap bolts and place suitable two part sealer in vertical grooves. Tap end of crankshaft rearward, then forward, and tighten main rear bearing cap to specifications. Remove excess sealer and reinstall oil pan.

CAMSHAFT

FRONT TIMING BELT COVER

Removal & Installation – Disconnect negative battery cable. Remove radiator upper mounting panel. On A/C equipped vehicles, remove upper half of fan shroud. Remove drive belts and engine fan. Remove front cover retaining screws and nuts, remove cover. To install, reverse removal procedure.

LOWER TIMING BELT COVER

Removal & Installation – Remove crankshaft pulley and front timing belt cover. Remove timing belt lower cover retaining nuts and remove cover. To install, reverse removal procedure.

UPPER TIMING BELT COVER

Removal & Installation – Remove camshaft sprocket. Remove upper cover-to-camshaft carrier attaching bolts and remove cover. To install, reverse removal procedure.

1.6 LITER 4 CYLINDER (Cont.)

ENGINE FRONT COVER

Removal – 1) Disconnect negative battery cable. Remove front and lower timing belt covers, and timing belt. Remove crankshaft sprocket with suitable remover tool (J-28509).

2) Remove front cover-to-case and front cover-to-oil pan attaching bolts and remove front cover. Disconnect wiring from distributor cap and remove cap. Remove coil and air cleaner. Disconnect fuel pump lines and remove fuel pump and push rod.

3) Disconnect vacuum advance hose. Note position of rotor and distributor housing in relation to engine. Remove distributor hold down clamp bolt and lift distributor from engine. Using a drift punch through distributor hole, drive off crankshaft spacer.

Installation – 1) Install a bead of RTV sealant on oil pan-to-front cover sealing surface. Place front cover on block and install cover aligning tool (J-26434) to center cover on crankshaft. Tighten case bolts and oil pan-to-cover bolts.

2) Coat inside of crankshaft spacer with sealant (1052080), and install spacer on crankshaft. Remove excess sealant. Install crankshaft sprocket and distributor. Snug, but do not tighten distributor hold down bolt.

3) Install fuel pump push rod and fuel pump, coil cover and coil and distributor cap. Install timing belt, crankshaft pulley and front and lower timing belt covers. Reconnect battery and adjust timing.

FRONT COVER OIL SEAL

Removal & Installation – Remove front cover and pry oil seal out with large screwdriver. Be careful not to bend cover. Place open end of seal toward rear of cover, support cover with suitable tool (J-9519-17), and drive seal into cover. Reinstall cover, using aligning tool (J-26434) to center seal on crankshaft. See *Fig. 3*.

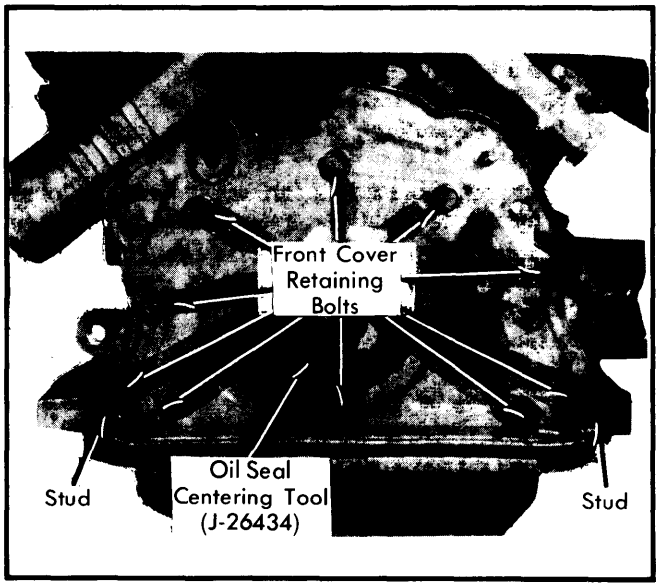

Fig. 3 Installing Engine Front Cover With Centering Tool Fitted Through Oil Seal Hole

TIMING BELT REPLACEMENT

Removal – 1) Remove timing belt upper cover and rotate crankshaft until timing mark on pulley is at 0° (No. 1 cylinder at TDC). Remove A/C compressor and brackets if necessary.

2) Insert 1/8" drill rod through hole in upper rear cover and camshaft drive sprocket. Remove timing belt lower cover. Loosen idler pulley and allow pulley to rotate clockwise. Remove timing belt from sprockets.

Installation – 1) Install belt on sprocket and use 1/4" Allen wrench to move idler pulley counterclockwise until all slack is removed from belt. Then tighten idler bolt.

2) Rotate crankshaft clockwise a minimum of one revolution. Stop with No. 1 piston at TDC. Do not let timing belt back up.

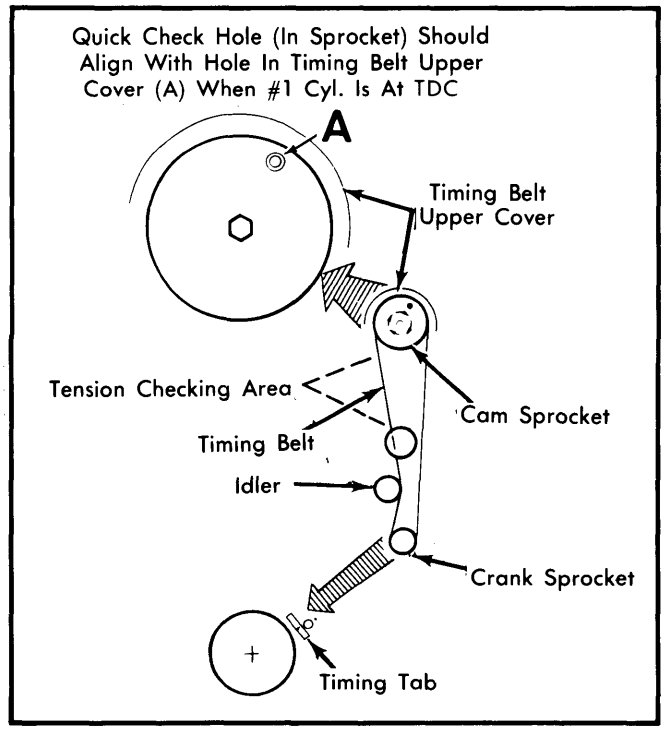

Fig. 4 Sprocket Timing Marks

3) Use belt tension gauge (J-26486) between camshaft sprocket and idler pulley. Be sure gauge finger is engaged in slot between teeth of timing belt.

4) Use 1/4" Allen wrench on idler pulley to obtain correct tension. Reverse removal procedure to complete installation.

Timing Belt Adjusting Specifications

Belt Size	Acceptable Operating Range	Adjustment Specifications
19 mm	50-80 Lb.	63-77 Lb.

CAMSHAFT

Removal – With timing belt and camshaft sprocket removed, remove rocker arms and heater assembly. Remove cam carrier

1.6 LITER 4 CYLINDER (Cont.)

rear cover and camshaft thrust plate bolts, slide camshaft rearward slightly and remove thrust plate. Remove motor mount nuts and wire retainers, raise engine and remove camshaft.

NOTE – *Heavy pressure is required to push camshaft forward since front camshaft seal will come with camshaft.*

Installation – To install, reverse removal procedure.

NOTE – *Apply Molycote (or equivalent) to rocker arms if camshaft is being replaced.*

CAMSHAFT BEARINGS

This engine uses no camshaft bearings. Camshaft rides directly in camshaft carrier. Inspect bearing surfaces of carrier for wear or damage. If bearing areas are defective, camshaft carrier must be replaced.

ENGINE OILING

Crankcase Capacity – 4 quarts with or without filter change. Change oil every 12 months or 7500 miles, whichever comes first.

Oil Filter – Replace at first oil change and every second oil change thereafter.

Normal Oil Pressure – 34-42 psi @ 2000 RPM.

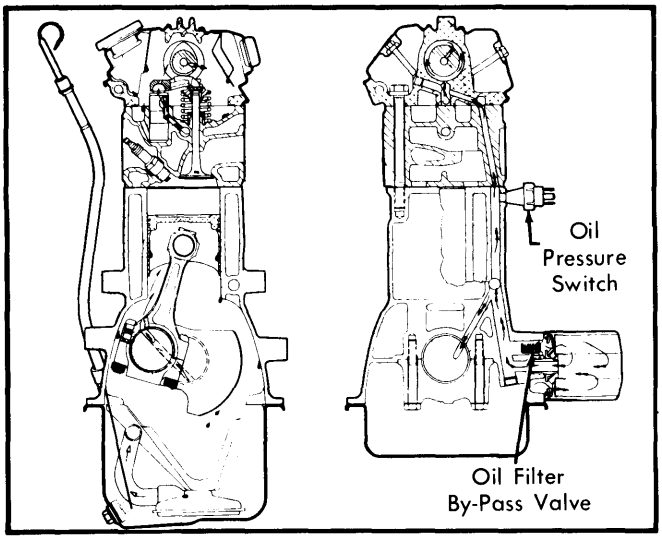

Fig. 5 Engine Oiling System

Pressure Regulator Valve – Located in oil pump body. Not adjustable.

ENGINE OILING SYSTEM

All oil from the oil pump passes through a full-flow oil filter and into a main galley on left side of block. Main, connecting rod and camshaft bearing surfaces are pressure lubricated along with valve lash adjusters. Piston pins and cylinder walls are splash lubricated. No lubrication is supplied to timing belt.

OIL PUMP

Disassembly – Remove oil pump cover bolts. Remove cover and gasket. Remove pump gear assembly, pressure regulator valve and related parts. Replace pickup tube "O" ring if necessary. Ensure "O" ring seats properly when pickup tube is installed in pump body.

Reassembly – Clean and inspect all parts for wear or damage. To assemble, reverse disassembly procedure.

NOTE – *Pump gears and body are not serviced separately. If pump gears or body are worn or damaged, replace entire pump assembly.*

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.
Camshaft Carrier/Head Bolts	75
Camshaft Sprocket Bolts	75
Crankshaft Pulley Bolt	75
Connecting Rod Nuts	40
Exhaust Manifold	
Center Bolts	15
End Bolts	22
Flywheel Bolt	50
Idler Pulley Bolts	15
Intake Manifold Bolts	15
Main Bearing Caps	50
Water Pump Bolts	15
Camshaft Cover Nuts	1
Crankcase Cover Bolts	5
Oil Pan Bolts	4
Oil Pump Cover Screws	7
Oil Pump Bolts	15
Water Pump Bolts	15

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore		Stroke		Displ.	
				in.	mm	in.	mm	cu. ins.	cc
1600 cc VIN "9"	70@5200	82@2400	8.5:1	3.23	82	2.98	75.7	97.6	1600

1.6 LITER 4 CYLINDER (Cont.)

ENGINE SPECIFICATIONS (Cont.)

VALVES

Engine & Valve	Head Diam. In. (mm)	Face Angle	Seat Angle	Seat Width In. (mm)	Stem Diameter In. (mm)	Stem Clearance In. (mm)	Valve Lift In. (mm)
1600 cc							
Int.	1.5303-1.5405 (38.87-39.13)	46°	45°	.049-.059 (1.25-1.50)	.3138-.3144 (7.970-7.986)	.0006-.0018 (.015-.045)	.3866 (9.82)
Exh.	1.2547-1.2657 (31.87-32.15)	46°	45°	.063-.075 (1.60-1.90)	.3130-.3140 (7.950-7.980)	.0014-.0026 (.035-.065)	.3866 (9.82)

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam. In. (mm)	Clearance In. (mm)	Thrust Bearing	Crankshaft End Play In. (mm)	Journal Diam. In. (mm)	Clearance In. (mm)	Side Play In. (mm)
1600 cc	2.0079-2.0088 (51.000-51.024)	①.0009-.0026 ①(.024-.066)	No. 5 No. 5	.004-.008 (.100-.202)	1.809-1.810 (45.958-45.984)	.0014-.0031 (.036-.078)	.004-.012 (.110-.316)

① — No. 5 Bearing only. Others, .0006-.0018" (.014-.046 mm).

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance In. (mm)	Piston Fit In. (mm)	Rod Fit① In. (mm)	Rings	End Gap In. (mm)	Side Clearance In. (mm)
1600 cc	.0008-.0016 (.020-.040)	.0001-.0003 (.003-.007)	.0007-.0020 (.019-.052) Press Fit	1	.009-.019 (.229-.483)	.012-.027 (.305-.686)
				2	.008-.018 (.203-.452)	.012-.032 (.305-.813)
				3	.015-.055 (.381-1.397)	.000-.005 (.000-.127)

① — Pin is locked in rod.

VALVE SPRINGS①

Engine	Free Length In. (mm)	PRESSURE Lbs. @ In. (kg @ mm)	
		Valve Closed	Valve Open
1600 cc	1.505 (38.23)	64-72@1.26 (29-33@32)	167-179@.886 (76-81@22.5)

① — Installed height, 1.26" (32.0 mm)

CAMSHAFT①

Engine	Journal Diam. In. (mm)	Clearance In. (mm)	Lobe Lift In. (mm)
1600 cc	.....	.002-.004 (.050-.112)	.2408 (6.1163)

① — End play is .007-.017" (.17-.43 mm)